Here are some number patterns to explore.
Some have been expressed numerically, some in words, and some algebraically.

Can you represent each pattern in four ways,
  numerically (so you can spot the pattern),
  in words (so you can describe the pattern),
  algebraically (so you can prove the pattern continues),
  and **using a diagram** (to explain the pattern)?

1. $2 \times 3 + 3 = ?$
    $5 \times 6 + 6 = ?$
    $4 \times 5 + 5 = ?$
    $9 \times 10 + 10 = ?$
    What do you notice?

2. Choose three consecutive numbers, square the middle one, and subtract the product of the other two.
    Repeat with some other sets of numbers.
    What do you notice?

3. $3 \times 3 - 1 \times 1 = ?$
    $8 \times 8 - 6 \times 6 = ?$
    $7 \times 7 - 5 \times 5 = ?$
    $10 \times 10 - 8 \times 8 = ?$
    What do you notice?

4. $n(n + 1) - (n - 1)(n + 2) = ?$
    $(n + 1)(n + 2) - n(n + 3) = ?$
    $(n - 3)(n - 2) - (n - 4)(n - 1) = ?$
    What do you notice?

5. $3 \times 5 + 1 = ?$
    $5 \times 7 + 1 = ?$
    $7 \times 9 + 1 = ?$
    $9 \times 11 + 1 = ?$
    What do you notice?

6. Choose three consecutive numbers and add the product of the smallest two to the product of the greatest two.
    Repeat with some other sets of numbers.
    What do you notice?